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CIRCULATION OF WATERS ON SURFACE OF THE EARTH.

III.

Let us now pass from the attracting power of the sun and moon to another impetus or force which they possess, namely, their heat. And as we above designated the former power as immeasurably small with the planets, so now in the latter case, we may omit all mention whatever of the moon; which, though it does not generate cold, as used to be thought, still its heat is so inconsiderable that only very recently it has been positively proved to possess any. In treating this latter point, then, that of heat, the only body deserving of notice is the sun, whose heat is so great that in one year it could dissolve a crust of ice a hundred feet thick, enveloping the whole earth. With every degree of heat, the water, the sea, too, on the surface, is changed into an aeriform, invisible body, which we call vapor, and which remains hidden from our view till it again returns condensed as fog, or a cloud. This evaporation increases with an increased extent of surface and a higher degree of heat; it is therefore greatest in the torrid zone. Incorporated with the air, the vapor, ascending from thence to the height of the atmosphere, becomes dense according to the degree of cooling, turning to rain, or snow, or dew, or hoar frost on the ground. To this process we apply the terms distillation and sublimation. As in the evaporation of water, it leaves behind it all the sub-

stances which it dissolved while in contact with its firm bottom, so rain water, being distilled water, is pure. If by an artificial extending of the superficies we increase the volume of evaporation, as they do in the south of France to gain the sea-salt, we can closely inspect this uninterrupted chemical analysis. The atmosphere is then, as its name shows, a great steam-apparatus, whose reservoir is the ocean, its furnace the sun, and whose condensing vessels are the higher geographical latitudes. If the rain falls immediately back into the sea again, it diminishes the pungency of the saline ingredients, which evaporation has intensified; and old sailors tell us that this is the case in the rainy season in so marked a degree, that in a calm, drinking water may be skimmed from the surface of the sea. For this reason the sea is less salt in the vicinity of the equator, in the region of calms, than in that of the rainless whirlwinds; it diminishes again in the tropics, where the sinking whirlwind induces new falls, the so-called sub-tropic rains. But if on the other hand the rain falls on the land, if the soil is porous it penetrates; or should the soil be rocky, or clayey and imper vious to water, it flows off to a lower lying level.

Now the surface of the earth is composed of strata lying one upon the other, till down into the deepest depths; those on the plain are disposed horizontally, while, on the other hand, those on the mountains take an inclined or sloping position. The gaping edges of those layers, the so-called strata-heads, can be seen best on the summits of the mountains; as if, in the heaving of the great bulk, the outer covering of the strata had been disturbed, and the bursting mass had hardened into the form of the crystalline rocks. The watertight and the porous strata alternating, the former fill with water when the rain falls on the exposed formations. The French have a good expression for such a spongy stratum, and call it *une nappe d'eau.* You can make the whole arrangement pretty clear to yourselves by a very simple contrivance. Take a pile of alternating sheets of dry writing-paper and well soaked blotting paper, and then bend up the whole upper part of the book thus formed, out of its horizontal position. You thus gain not a bad idea of how the strata look at the top of a mountain. Farther: if you join two vessels at the bottom by a cross-pipe, and pour water into

the one, the water in the other will rise as high as in the first, no matter how it may differ in size and capacity, nor how long the pipe is. If you lead a pipe through a dike by the sea shore, and curve it round, the water will rise to the sea level even though the pipe should end in a quill. Add one drop, and the whole ocean rises, naturally in proportion to its expanse. This is called the law of the communication of tubes; of such tubes the U-shaped offers the simplest illustration. This law of course holds good for any number of vessels connected by tubes. Such are the Suterazi of the Turks, who, when they desire to conduct water from the one hill to the other, carry a pipe down the one hill, right across the valley, and up the ascent of the second. Had the Romans been acquainted with this principle, they would not have reared their splendidly-arched aqueducts, which bear a more brilliant testimony to their feeling for art than to their knowledge of physics.

The arrangement for providing all larger towns with water is only an imitation of these Suterazi. A main reservoir is almost filled up with water, the connecting pipes branch off as required, under the street pavement, and from these the communicating pipes are conducted into the houses, and carried to a height which of course does not exceed the level of the main reservoir. The effort to rise is everywhere equal, and the upper wall of the horizontal part of the pipes, therefore, has to withstand a pressure from below upwards. If it cannot withstand the pressure, the water oozes out, and a source is found. For, indeed, what else are those *nappes d'eau*, but the water in those pipes, the walls of which are formed by the water-tight layers? Hence the springs ooze out at the foot of the mountains exactly where the upper covering has cracked, in making a bend round. But the spring is often to be found at a greater distance from the base; where, for example, the stratum comes to an end in the plain, or has been burst at some point. If the strata are disposed horizontally on either side of a so-called erosion-valley the water issuing thence can have no ascending power, unless the layers assume an inclined position at a greater distance. Those valleys lined with sloping layers fall into three divisions, viz: into concave or basin-shaped, in which the strata of both walls dip towards the valley; divergent valleys, where this is

the case only on one side, which presents a succession of strata, sloping gently downwards, and the other a steep descent laying bare the heads of the layers; and lastly, chasms, in which the heads of the strata are turned to both sides of the valley, and slope off to the outside. From this, it is to be expected that springs may be found on both sides in the basin-shaped valleys; in the divergent valleys only on the sloping side, and in the chasm not at all; as the rain falling on the heads of the strata would simply feed the springs of a neighboring valley. But nature has frequently neglected to make the opening for the spring to bubble forth, and man must come to her aid, by breaking through the upper stratum with a ground-auger, and in this manner get a well, an Artesian well, so called from the province of Artois, where they were first introduced into Europe, in the year 1126. The ascending power of the water naturally depends on how high the curve of the layer is filled with water. As long as the auger is boring in the upper stratum it remains dry, but immediately fills with water as soon as the last wall is pierced, just like those pipes laid in our houses as a protection against fire, which, being left empty in winter to prevent freezing, fill instantly the obstruction is removed. If the *nappe d'eau* has no side bent upwards, *i. e.*, if it is filled merely by lateral infiltration, then on reaching the water we get only a well, to obtain the water out of which, it has to be drawn or pumped to the surface. If the spring has been bored in a high-lying region, it is possible the water does not rise to the surface at all, but remains at a certain depth, corresponding to the point of issue of the stratum in the mountains. If the water-tight layer over the porous one were quite wanting, the water, if it possessed any force to ascend, would do so of itself. In this case it would be useless to add a new bore to the many already made.

The irrigation of the deeper-lying oases in Sahara seems from the most ancient times to have been effected by means of Artesian wells. Shaw says of Wad-rag — a collection of villages at the entrance of the Sahara—that these villages have no springs, the inhabitants procuring water in a peculiar manner. They dig wells, a hundred or even two hundred fathoms deep, till they find under the sand a stone resembling slate, under which

the Bahar taht el erd, that is, the water is found under the earth. This stone is not difficult to pierce, which being done, the water bursts forth so suddenly and in such abundance, that the men who have been let down frequently perish, though drawn up as quickly as possible. Olympiodor tells of the digging of such deep wells in the great oasis. They are called Bahr in the erosions of the lower plateau; on the plateau itself, Schreia.

When in the year 1844 after the battle at Meggarin, General Desvaux was encamped in the oasis Sidi Rasched, he remarked that on one side of it the palm trees looked poor and shabby, while they were sound and flourishing on the other. On enquiring into the reason of this peculiar appearance, he was informed that there was a scarcity of water, the chief well having fallen in; and as they possessed no means of digging a new one, they were awaiting the day when their palms would cease to bear fruit, and they should all die of hunger. It was Allah's will. The General, on his own responsibility, concluded to send to France for a boring apparatus; an engineer from of Degousee in Paris, was summoned. He found the matter practicable, and the following winter, after a division of Spahis had worked for four days, a spring bubbled forth out of the deserted shaft, bringing 4,300 litres of water a minute. The inhabitants rushed in crowds to the blessed spring, bathing their children in it. Now came petitions from all the other oases for similar favors, and since then some fifty wells have been brought into use without visibly diminishing the volume of water in those already dug. The love of exaggeration now prevalent has led many to express a hope, that in the above manner the desert would, in course of time, be changed into a lovely garden.

The abundance of water in a spring may be exceedingly embarrassing. A considerable number of years ago, an Italian proprietor had an Artesian well dug in his grounds, but it proved to be so powerful that it inundated his own and his neighbor's estates. All endeavors to stop the spring were unsuccessful; and the lawsuit for damages in which this involved him, completed his ruin. The story of Goethe's Zauberlehrling was realized on him to his misfortune. Frequently the water-tight stratum runs away over the tops of the mountains and

the heads of the porous layers, which are then prevented from filling with water. This was the case in Marseilles, where the fruitful soil of the vineyards was often entirely washed away by the thunder-plumps (rain spouts). It struck the vintagers to bore deep holes through the upper stratum of clay, and to construct channels into which to carry the rain-water; and since that time springs about the circumference of a man's arm, which were unknown before, have formed at the harbor. In the year 1831 the fountain in the cathedral square in Tours cast up branches and shells from a depth of 335 feet.

Can we still doubt, in the face of those facts, that the water which oozes forth in natural springs is originally Tagewasser (daylight-water; the water which penetrates into a mine from the upper strata) as the miners call it. And who knows it better than they, they who keep up an unceasing struggle to get it under, who construct pits and channels over the pits and mines in order to prevent it breaking in, by carrying it off rapidly; and who after a heavy shower of rain see it appear, first in the lower, and afterwards in the lowest depths. How many sources dry up after long drought, many so frequently as to get the name of "hunger-springs," by way of contrast with those in Switzerland in spring, and which on the first dissolving of the snow burst forth everywhere. And yet there are still to be found adherents of the so-called capillary system. We know it is true that in a narrow tube the water, with a curved concave surface, stands higher than in a wide vessel into which the tubes are introduced; but the water can be higher only as long as the surface is hollow; if it has run out, the surface must first be equalized; that, however, can never be, because then the condition of standing higher no longer exists. You see in dipping a bit of sugar into your coffee, it imbibes the coffee, but no coffee spring will ever bubble forth out of it.

But we are told that in the hot summer of 1822 the waters collected in unusual quantities at the bottom of the mines in the Hartz Forest, while on the surface all the springs ran dry. How easy it was to explain this by saying, that the earth, loosened and cracked by the heightened temperature, its natural capillary tubes were so much widened that they could no longer raise the water to the surface, hence it was compelled to col-

lect at the bottom! This explanation is certainly simple, but simpler still the following: that as those waters were raised by means of mill-works driven by springs, on the drying up of those springs, the works stood still and could not raise the waters!

[*For the California Teacher.*]

PHYSIOLOGY OF THE BLOOD.

Although physiologists of ancient times considered the blood as playing an important part in the animal economy, and although in somewhat later times considerable attention was paid to the study of it, it was not till the microscope was placed in the hands of the naturalist that any exact knowledge of its nature was attained.

By aid of the microscope we perceive that the blood is not a homogeneous fluid, but a mixture of ingredients differing greatly from each other in nature. The blood is water holding in solution albumen, fibrine, fatty and saccharine substances, and several alkaline salts; it also floats vesicular globules composed of hematosine, globuline and some other albuminoids, phosphureted fatty substances, earthy salts and one compound salt containing iron. Thus the simple ingredients which appear to be essential to its constitution are oxygen, hydrogen, carbon, nitrogen, sulphur, phosphorus, chloride of sodium, iron, potash, soda, calcium and magnesium. Thus we see that the blood contains every element necessary for the building up of the tissues of the body.

These furnish compounds of two kinds; the one combustible and consequently combining easily with oxygen, thus creating new products; the other consisting of substances that have already undergone combustion, and consequently are not affected by this principle of oxygen; the fatty and saccharine matters belong to the first class, the water and inorganic salts to the second.

The compound substances of the blood remain therein for a longer or shorter time and then disappear, having suffered destruction, expulsion from the system, or been employed in the building up of the tissues of the body. There is no invariable

standard regulating the proportion which they must maintain to each other, yet each zoölogical species has its own general standard, variations from which beyond certain limits denote variations from the normal standard of health.

The *temperature* of the blood is independent of the surrounding atmosphere; it is the result of chemical processes taking place within it; in man it is from 37° to 38° centigrade, while in birds it is about 4° higher; in the lower vertebrates it is but little higher than the surrounding medium.

There is a general relative proportion of the *weight* of the blood to the weight of the body; this proportion varies in different animals, being greatest in those which present the highest degree of physiological activity or vitality; in animals of the same species the relative weight of blood in those below the average size, is greater than in those of abnormally large growth. In man about one twelfth or one thirteenth of the weight of the body is blood, in woman a little less; in children about one nineteenth. Abstinence from food diminishes the quantity of blood in the body; the same occurs in certain pathological conditions of the system.

The *function* of the blood is to build up the tissues of the body, and to carry away worn-out particles; it is contained in a system of tubes which are impermeable, except for the interchange of matters between the blood and the more solid flesh.

The *color* of the blood is not uniform, but may vary many shades in different individuals, in the same individuals in different parts of the vascular system, and at different times.

Let a drop of blood be magnified from 300 to 400 times, and it will appear to consist of a multitude of corpuscular elements, while the fluid in which they float is betrayed only by the swimming motion of these little bodies. The *fluid* is called the *plasma* or *serum* of the blood, and constitutes about three quarters of its volume; the *corpuscles* are called *blood-cells*, and constitute about one-eighth of the volume of the blood—that is, when they are separated from it, and become dried; Lehmann thinks that in the living blood they constitute at least one-half.

RED BLOOD-CELLS.

The red blood-cells represent the most remarkable feature of

the blood as we examine it under the microscope; it is to them that the blood owes its color, and they form a dividing line between the Vertebrates and the Invertebrates, never being found in the latter. They are but little more dense than the liquid in which they float, which liquid they render more opaque, while they diminish its fluidity but little.

Minute as these little bodies are, measuring in man but about the 250th of a line in diameter, they are, nevertheless, of a very composite character. Two of their constituent parts are globuline, an albumen-like substance, and hematosine, which is also an albuminoid, and is found combined with iron. These two substances are both easily dissolved in water, but the serum of the blood holds in solution certain ingredients which combined render these substances insoluble, and thus the blood-cells remain intact.

The blood-cells were formerly supposed to owe their red color to iron; experiment, however, has proved that the blood deprived of all iron still retains its color; and since this has been proved, physiologists have sought, and sought in vain, for the true coloring principle of the blood; modifications of its color have been referred to modifications in the form of the cell at different points of its circulation, to hematosine and to the gases of the blood.

The blood-cells appear to be minute chemical laboratories within which the work is accomplished of effecting certain chemical changes in those substances which are held in solution in the fluid surrounding them, and having performed their allotted labor, they cease to exist. They play an important part in the phenomenon of respiration, acting as storehouses or condensers of oxygen; the oxygen is apparently absorbed by the plasma or serum, which then delivers it up to the keeping of the globules; these condense the oxygen, without changing it chemically, and carry it to every part of the system.

In the different classes of Vertebrates the red blood-cells vary in *form*, *size*, and *structure*.

I. In the Mammalia they are circular, while in oviparous vertebrates they are elliptical; exceptions to this general rule exist in the camel, llama and chameleon, which have elliptical blood-cells, while in a few of the lowest order of fishes they are circular.

II. They are smallest in the Mammalia, and increase in size in an order exactly corresponding to the classes of the animal kingdom; thus, smallest in the Mammalia, next in Birds, next in Reptiles, next in Fishes, and largest in the Batrachians. Among the Mammalia, we do not, however, find the smallest in man, but in the Ruminantia, while the Bimana and Quadrumana differ but little from the Rodentia. Examining further, we find that although the size of the body has nothing to do with that of the blood-cells, yet the smallest animals are, in general, the most active; that rapidity of motion is intimately connected with frequency of respiration, and that in animals constituted according to the same fundamental plan, the tendency of nature is to render the blood-cells smaller in proportion as the necessity for respiration increases. This is illustrated in the deer (particularly the musk deer), the stag, and the antelope, who are among the fleetest of animals, and are consequently obliged to breathe frequently, and in them we find the smallest blood-cells.

III. The microscope reveals a dark spot in these minute bodies, which, in the Mammalia, seems to be caused by a central depression, while in the lower animals it indicates the presence of a solid nucleus, and this nucleus may be considered as a sign of physiological inferiority.

In those viviparous animals (camel, etc.) which present the anomaly of elliptical globules, these are found to be destitute of a nucleus; hence the characteristic distinguishing viviparous from oviparous animals seems to be the absence of the nucleus, rather than the circular form.

Again, the structure of the peripheral portions of the red cells, is a question yet to be determined; some suppose them to be enclosed by a kind of membrane, thus forming isolated cells, while others consider them mere masses of gelatine-like substance; there is, however, a strong leaning to the opinion that they consist of a membranous wall (which must be perfectly transparent, since it is the contents within which lend the blood its color), and a gelatine-like substance, rather than a liquid, between the wall and the nucleus. The nuclei are composed of nucleoli. The origin of the red blood-cells is unknown.

WHITE BLOOD-CELLS.

Besides the red blood-cells there are also white blood-cells, and these, unlike the former, are found both in Vertebrates and in Invertebrates. It is believed they originate in the spleen, liver, and other glandular organs of the body. Of these cells there are at least two kinds, and some physiologists think to have discerned four; their nature is not well known, and the solution of the problem depends on the test of chemical reagents as well as upon the microscope. Their number is less than that of the red blood-cells, being in the ratio of one of the former to three or four hundred of the latter.

One kind, which may be called elementary globules, are much smaller than the red globules in man; they appear to consist of a fatty substance surrounded by a layer of albumen; they abound in the blood soon after eating.

Another kind, sometimes called plasmic globules, are larger than the red blood-cells in man; they vary in structure, and are less abundant than the elementary globules.

One thing remarkable in them is the changes of form which they are seen to undergo when observed under the microscope; the motion thus produced resembles the movements of an animal, and hence it has been suggested that they are really animalcules, a theory, however, not accepted by physiologists in general.

In some diseased states of the system the blood exhibits the phenomenon of abnormal blood-cells also.

The blood-cells grow and become modified with age; they are the seat of physiological phenomena, and are endowed with a special activity. We know that the secretory organs of the body—liver, salivary glands, etc.—perform their functions by means of cells, that is, that the secretion of the bile in the liver, of the saliva in the salivary glands, takes place within the cells of these organs; the cells of the blood appear to be of the same nature, differing only by being left to float freely in a fluid instead of being united so as to form layers, tubes, or compact masses, and thus we may look upon them not as simple concretions of animal matter, the result of precipitation or coagulation, but as miniature elementary organisms; and hence the blood may be considered as a living fluid, as liquid flesh.

L.

RUTS.

An order of exercises is considered an indispensable part of the teacher's belongings; we carve up our time into pieces of various lengths, which we endeavor to adapt to the varied wants and requirements of reading, arithmetic, spelling, music, and all the thousand and one tasks which the busy teacher finds to do. After having appropriated every second of breathing time, we make ourselves and our pupils miserable by endeavoring to carry out our programme with the most rigid exactitude. While every nerve is strained to its work, we go over the same old rigmarole day after day, week after week, beating ceaselessly at the same old tasks, at precisely the same time of the day, until we find that our pupils are yawning over their books, and that we are not accomplishing half as much as we expected when we made out that wonderful order of exercises, in which not a moment was wasted.

When we discover that we are teaching in a rut, and feel sure that something must be done to get out of it, what do we do?

Some do not realize what the trouble is; find their scholars sleepy, and know no better way of waking them up than by using the rattan very freely; it wakes them up, perhaps, but whether it makes better scholars of them, is a question open to considerable discussion. When the rattan is used as a cure for laziness, I imagine that its work is rarely crowned with success. Of continual scolding, though there is a strong temptation to it, I have still less an opinion: since it wears out the strength of the teacher, and rather amuses the scholars than otherwise. They are the wisest, I think, who look the matter over, and change their programmes.

It is a good plan, endorsed by many good teachers, to turn the programme upside down, as it were; that is, have that study or recitation first which we are in the habit of having last, and so on. Those who have never tried this simple expedient, will be astonished to see what an effect it has on a sleepy and uninterested class of children; they weary of the old things which they do not know or understand, but have nevertheless grown very tired of; and if the studies are taken up in the morning light instead of the afternoon, they seem much clearer

to their young eyes, and get a little of the gloss of newness on them besides.

But more fatal by far than the unvarying time, is the monotonous *manner* of teaching, into which we fall the more naturally, because our nerves are strained to the utmost tension and we are sorely tried, and it *is* much easier to teach in a rut, than out of one. In the days, now gone by, in which no small amount of time and attention was given to oral instruction, the object lessons, which might have been a means of exciting considerable interest among the scholars, were taught by two thirds of our teachers in a way which would have excited derision and scorn in any well conducted kinder-garten. Not but what we knew that the object should be at hand in giving the lesson, and passed around the class; that the children themselves should be allowed to do some of the talking, and that some small infractions of discipline might be overlooked; that, in spite of blunders, and the silly speeches in which some children delight, and the slow progress made in the search after information, knowledge drawn out was and is worth five times as much as that poured in; although we knew this quite well, we were perhaps tired; the object was not at hand, and the time could not always be spared from other lessons; patience had been sadly worn upon during the day, and we rarely felt like overlooking anything in the way of naughtiness; and it *was* easier to put the lesson, or rather, the skeleton of what the lesson ought to have been, on the blackboard, and say, "Copy it, and then study it." It did just about as well when they were examined, and if it was rather "rutty" it saved a great deal of work. With little children the plan was the same in effect, if a little different in method. "Now, children, put your hands behind you, and listen to every word I say; pay attention all the time, and don't forget anything." This was, of course, quite sufficient to make the lesson totally useless, but the teacher was unconscious of the fact, and went on: "Say this after me; 'The parts of a pin are: head, shank, and point.' Say it three times. Johnny, what are the parts of a pin?" And so on, till oral instruction, which might have been so profitable, became a perfect bore to scholars and teachers, until it was dropped at last from the course of study, to the infinite delight of both.

Another study, if study it could be called, which was always laughed at, and generally neglected, was called morals and manners. Morals was understood by most teachers to mean, learning ten maxims, as well understood by the children as though they were Greek instead of English; and manners were taught by means of memorizing three rules for good behavior. This was all very well, but calling it morals and manners was unmitigated nonsense. Some teachers, while they would be the first to discountenance cheating, lying, and stealing, or rudeness of any kind, maintain that morals and manners can be inculcated, but *not* taught; it is certainly something in which children should not be examined. If we could talk to our pretty, well dressed, well cared for little girls in such a way as to make them more considerate for those who have been less fortunate in their surroundings, we should do an amount of moral teaching more effective than five hundred maxims.

Because Biddy Mack does not belong to her set; because she wears calico dresses without any starch, and dreadful calfskin boots; because she picks up chips in a big basket, and buys flour at the corner grocery by the ten cents' worth, and stays at home on Mondays to help her mother wash, little Miss Elegance never notices her unless when questions in the tables are being passed around, when Biddy is found to be handy, if her hair *is* up, and her stockings are down.

Over the schoolroom door should be written in letters of gold, Marian Douglas' line, "'Tis only good children the angels call fair."

If the teacher by many efforts could but make the little lady understand that those Mondays on which Biddy's seat is vacant are very long to the little girl, no bigger than herself; that she has to rub out the stocking feet; (so many pairs of little stock ings!) and wash the towels through the first water, and tend the baby, and run errands, and help get dinner, and empty the tubs; that the work is not easy, and the arms very small. That there is a big wolf who has been watching their door for many months and years, and that he sometimes comes so close that the wretched mother and the trembling little children can hear his hoarse growl; that he is so fierce and so determined to have his prey, that even the *little* shoulders must be braced to the

wheel whose turning brings them bread, and the little hands must do what they can to beat him away for a while longer. Tell her that the name of the wolf is Poverty, and we hope she may never meet him at her threshhold.

Then Mary Malone, who sits next to her, has such big, coarse hands, and *such* red hair; Miss Elegance "can't endure her," and doesn't scruple to show it. How well might her teacher point to the golden letters over the door, and tell her that angels look past the face and see only the soul; and that she wouldn't wonder if they smiled on poor red-handed, red-headed, red-eyed Mary, while they looked on her with very doubtful eyes. The teacher could whisper to her that the redness of Mary's eyes is caused by tears; that when she thinks of the mother (beautiful to her, because she *was* her mother), whom she had, and has not; her childish heart aches with a bitter pain the little lady's has never dreamed of, and the carrotty head turns from the pillow, and the slip is wet with her tears, night after night. Such moral teaching might fail, but it might have its effect; at least one shell of selfishness might drop away from the wofully selfish little heart; moral *teaching* worthy the name it would be, certainly.

Since the introduction of the Grube system, much "ruttiness" in the teaching of tables has been done away with. Children used to have a peculiar way of "sing-songing" the tables, in which they took an immense amount of satisfaction; if the teacher did not chance to be nervous it was rather soothing than otherwise, and it kept the children out of mischief, but it never taught the difference between one and three, nor the sum of two and two. It was a dreadful rut, but the educational machine seems to be lifted out of it now. The system substituted for it, though much more wearing on the teacher, is so clear, so rational, so interesting to the children, so lasting in what it teaches, that we all owe our thanks to the originator, who evidently is not a man who believes in an unvarying programme, which does not waste a moment, and provides for everything but breathing-time. C. G. D.

[*From The Garden.*]

PREPARING SKELETON LEAVES.

By JAMES F. ROBINSON.

We have recently heard much about finding suitable employment for ladies, and allowing them to enter the medical profession, etc. I leave these discussions to abler minds; and, in a more humble manner, I shall endeavor to point out a little congenial employment for the leisure hours of our fair readers; one, moreover, in which, whilst they are usefully occupied, they will derive both amusement and pleasure. Most amusing scientific work is simply adapted for the passing hour; but mine, if enthusiastically followed, will bring joy when glanced at in years to come, for "A thing of beauty is a joy forever" in more senses than one. A very pleasant occupation for leisure moments is the art of preparing, or rather skeletonizing leaves. The old method, as most of my readers are aware, was simply to immerse the leaves beneath water for several weeks until the epidermis and parenchyma had decayed; then, taking them out, to rub off the decayed fleshy or cellular matter in a bowl of clean water. To say the least of this method, it was very unsatisfactory and often yielded results far from pleasing, without taking into consideration the great amount of patience needful to complete the process. Now, thanks to chemistry, we have another better plan, not occupying as many hours as the old decaying method took weeks to accomplish. An excellent recommendation for processes of this kind is their simplicity, as anything complicated, or requiring expensive requisites in its performance, is sure to be scouted, or, at most, to gain but few adherents. Most of my lady friends to whom I have recommended the undermentioned process for skeletonizing leaves, have fallen so much in love with it, as to follow it up constantly in Autumn, merely for amusement. The result has been the production of many an elegant drawing-room ornament, either being placed in a vase or mounted for framing beneath glass, as a permanent record of their industry. First dissolve four ounces of common washing-soda in a quart of boiling water, then add two ounces of slaked quick-lime, and boil for about fifteen minutes. Allow this solution to cool; afterwards pour off all the clear liquor into a clean saucepan. When the solution is at the boil-

ing point, place the leaves carefully in the pan, and boil the whole together for an hour. Boiling water ought to be added occasionally, but sufficient only to replace that lost by evaporation. The epidermis and parenchyma of some leaves will more readily separate than in others. A good test is to try the leaves after they have been gently simmering (boiling) for about an hour, and, if the cellular matter does not easily rub off betwixt the finger and thumb beneath cold water, boil them again for a short time. When the fleshy matter is found to be sufficiently softened, rub them separately, but very gently, beneath cold water until the perfect skeleton is exposed. The skeletons at first are of a dirty white color; to make them pure white, and therefore more beautiful, all that is necessary is to bleach them in a weak solution of chloride of lime. I have found the best solution is a large teaspoonful of chloride of lime to a quart of water; if a few drops of vinegar be added to the bleaching solution, it is all the better, for then the free chlorine is liberated. Do not allow them to remain too long in the bleaching liquor, or they will become very brittle, and cannot afterwards be handled without injury. About fifteen minutes is sufficient to make them white and clean-looking. After the specimens are bleached, dry them in white blotting-paper beneath a gentle pressure. Of course in this, as in other things, a little practice is needful to secure perfection. Simple leaves are the best for beginners to experiment upon: Vine, Poplar, Beech, and Ivy leaves make excellent skeletons. Care must be exercised in the selection of leaves, as well as the period of the year, and the state of the atmosphere, when the specimens are collected, otherwise failure will be the result. The best months to gather the specimens are July to September. Never collect specimens in damp weather, and none but perfectly matured leaves ought to be gathered.

ESSAY ON FORM, AS A BRANCH OE EDUCATION.

BY PROF. CONRAD DIEHL, ST. LOUIS, MO.

INTRODUCTION.

Only knowledge of form enables mankind to transform raw material to its use. The culture of a people can be measured

by the standard of its utilitarian and æsthetic productions in form. The study of *form* must therefore be considered as one of the most essential branches of public education. It is but too true that in the pursuit of this study no satisfactory results have hitherto been attained in our schools. Whether it is owing to a lack of recognition of the value of this study, or to the absence of a rational method, or both, forms the subject of this address.

Before I can attempt to develop my views, I beg leave to lay before you a series of questions which are of the greatest importance in the consideration of this subject; questions which I have repeatedly revolved in my mind since I have become identified with Art-education in St. Louis.

1. What are the best subjects for study, and in what manner are they to be presented to the pupil?

2. What technical means are to be employed in working out these subjects?

3. In order that a child may learn to comprehend fully the nature of a straight line, should the teacher illustrate such a line on the blackboard *without* the use of a ruler, and should the child likewise be refused the use of the ruler, when drawing straight lines?

4. Should a teacher, in describing a circle, or a section of a circle, or in dividing a line into a given number of equal parts, perform this task without the use of dividers? and should the pupils be likewise required to accomplish it without the aid of such an instrument?

5. Should a class engaged in constructive or imitative work, be refused the use of the ruler and of the dividers, where success in the execution can be tested and governed only by means of these instruments?

6. Would not the demonstration and illustration of geometrical plane figures and of geometrical solids be materially aided by the use of things of daily use which exhibit these figures, and are familiar to the child, while the abstract figures of geometry are new to it, and therefore bewildering? This, it appears to me, is a very important point, as it embodies the first principle of object-teaching, namely: that we must proceed from the known to the unknown.

7. Can receding surfaces be illustrated to a child from drawings on the flat?

8. Should free-hand drawing be practiced in any case but that in which the use of instruments is impossible, as in drawing from real objects, or in sketching?

9. Should not the child, in drawing from real objects, be made familiar with the use of the plumb-line for gauging points within an object, lying in a vertical direction? and also with the process of comparative measurement by means of which the proportions which an object presents in its relations to the eye are compared as thrown upon a plane?

10. Can a teacher present clearly to a pupil a subject with which he or she is not thoroughly acquainted? and, if the study of form and its conditions is to be made a subject of public education, is it possible that such subject can be successfully pursued, unless the opportunity is offered to teachers by Boards of Education to become thoroughly competent and conversant with that which they are to present to children?

11. After teachers have become thoroughly conversant with the phenomena of form and its construction, should they not be supplied with a oomplete set of models, so constructed as to be separable into their component parts, and into pieces showing the various sections? and should not these models be accompanied by charts upon which these parts are illustrated, in ground plan, elevation and sections, on the scale of the models, together with their constructions according to the rules of perspective, showing the precise appearance of the models in a given relation to the eye?

12. Would not the introduction of an apparatus in which the principles of perspective are embodied, materially aid this study?

PART I.

Of all matters important to the culture as well as the material welfare of a people, not one has been more superficially dealt with in educational systems than the training of the intellect in regard to an understanding of the nature of form. Few among the masses are able to use it as a means of communication, and it is no venture to assert that ninety-nine per cent. are incapable of giving a description of objects by any other means

than words (although before they could designate an object with a word, their eyes had made them familiar with such object), simply because they had never been taught how to see. Yet make this last assertion, and you are either denounced as a maniac, or as an overbearing pretender. You will readily be convinced that those persons can recognize an object at as great a distance as you can; furthermore, that they make distinctions between long and round heads; crooked, snub, aquiline, or other noses, etc.; in short, that they can enter into a verbal description in detail of anything which, by means of vision, they had ever committed to memory; and no doubt, at the moment of description, the object described stands vividly before their mind's eye; but stop them short, avert your face, ask simply which of the two eyelids overlaps the other, the upper or the lower, and you will, nine times out of ten, receive an answer to the effect that they have never examined, despite the fact that there is not a feature which they have more closely scrutinized, and that the eye has been the means of conveying to them all visible impressions. They have failed to examine, simply because they have never been taught how to see. The impression is prevalent among the masses that access to the domain of form is restricted to a few persons of talent, who are particularly endowed by Providence. The existence of this delusion cannot astonish us, since form, that manifestation of matter most easily recognized by the senses of sight and touch, has not yet been subjected to a definite system of investigation and analysis. In connection with this, it may be well to state, that the practical result produced in Schools of Art tends to prove. that the talent most promising on entering does not invariably carry away the palm in the end; but that, on the contrary, those who arrive at the highest distinction gave but indifferent promise at first. These concentrated their force on the training of the mind, in consequence of which their power of execution lagged behind their mental accomplishment; they worked with modest assiduity, and after they had chosen a worthy subject, overcame all technical obstacles, regardless of sacrifices; whilst many of the most promising talents, transported by momentary success, thought that it did not require great exertions on their part to excel, numbered

themselves among the chosen, until it was too late to mend. Thus popular prejudice has been the ruin of many talents who, with earnest application and perseverance, might have become shining lights in their profession.

Form presents three separate fields for investigation:

1. The analysis of that which exists, *i. e.*, learning *how to see.*

2. The digestion of that which exists, by separating and combining the same, *i. e.*, learning *how to think.*

3. The embodiment of our thoughts in form, *i. e.*, learning *how to create.*

When we contemplate a work of art, in sculpture, architecture or painting, we do not realize that these, together with all results produced by the trades, are deduced from one common source. We may readily assert that a chemist can become a successful soap manufacturer, or an artist a joiner or shoemaker, while it would be venturesome to infer the contrary: we readily conclude, that the more a soapmaker knows about chemistry, or a joiner or shoemaker about form, the greater will be his success in his vocation.

The question forces itself upon us, whether the elements of the study of form might not be introduced in the primary classes of our schools as advantageously as Natural Sciences, a question which I answer in the affirmative. I feel confidence in this assertion, because in the first steps taken in the training of the mind, forms are used; the children are made familiar with arbitrary signs designed to represent sounds, *i. e.*, with letters. Form is next brought into direct requisition by accompanying combinations of these signs, *i. e.* words, with illustrations of the objects they designate, to aid the memory in retaining these words; then, in training the mechanical capacity, the child is taught to imitate those signs, *i. e.*, to write; they thus actually receive the first lessons in free-hand drawing, learning to draw straight lines and curves, and to combine these lines in certain relations and proportions. Beyond this, their imitative capacity in the actual writing of form receives no training, and why? Who will hesitate to declare that, just as a reading lesson is aided by accompanying words with illustrations, a training in the writing of real form, *i. e.*, in drawing from real objects, would materially aid the reading lesson? In the study

of form it may be deemed equally essential that the child should contemplate the best and most beautiful, according to the capacity of its understanding; as in language it is considered necessary that the precepts of the teacher should be unexceptionable, and his or her language simple and correct. It will be found in form, as in language, that the progress made by the child is not limited to the training in school; since, before it entered, it had already exercised the eye, as well as, to a certain degree, acquired the use of language. What it gains in school is practically developed outside by intercourse.

Can we reasonably claim that the eye of a child, up to the time it enters a school, has been less active than its tongue or ear, when we positively know, that it learns to identify words with objects and sensations long after it is familiar with such objects and sensations? Do we not frequently find children making attempts to draw objects before they have the faintest idea of word-writing? Is not writing in form a transmutation of ideas into the universal language? And could any teacher conversant only with the language of his nation, read books written in foreign languages, whether French, German, Spanish, Russian, Arabic, Chinese, etc., as readily as a man or woman properly trained in the reading and writing of form would read their designs, or even a child their picture books designed expressly for children? Are we not entitled to anticipate as decided results by encouraging a child to imitate form, as we attain in language, by systematic training? The great end which we attain in reading, is to learn to understand that which has been written by others; in writing and speaking, to communicate our thoughts to others; in drawing, to embody ideas in form. What we know or see, we can communicate by these means; there are, however, many things which we can communicate in writing and not in drawing, and *vice versa*.

Before proposing a new plan for instruction in drawing, it is necessary to give sufficient reason for condemning the system hitherto in use, *i. e.*, drawing from cards.

All elementary drawing-cards commend themselves to the eye as being well adapted to the purpose of teaching juveniles how to draw, inasmuch as they offer precisely such representations as the child would attempt in drawing from the objects

themselves, *i. e.*, outlines. Such patterns teach a child to ignore the fact that objects are bounded by planes, and can be represented from more than one point of view. Now, instead of setting a child to copying such meaningless things, why not place it under the guidance of a person who can direct it to draw the outlines of the various sides of an object, that it may learn to understand the value of surfaces in various positions?

Let children, from the start, be impressed with the true condition of things, and if a child is considered too young to be benefited by a consistent proposition, let us not pervert its judgment by trying to accommodate the matter to its understanding in a manner which is ever subject to contradiction; but let us wait until the child is prepared. Then, instead of teaching it to identify outline and shading with form, let them understand that what is technically described by an outline, is the boundary of an object, conditioned by its surfaces escaping the angle of vision; and that what is called shading, is the gradation of light on the convex surfaces of the object, in their relation to the source of light; furthermore, that the side opposite to that which receives the direct light is also illuminated, only in less degree, by reflection.

How can a receding surface be made clear to a child from a drawing card? If it is merely the object to train a child to perseverance in aimless work, nothing can be better calculated to produce this effect than drawing cards, although the same end might be attained by suffering it to stare at a point on the wall for hours at a time. By placing a child before a natural object, we at once call its reasoning faculties into activity; by placing it before a card, we leave these faculties in repose, and its eye patiently glides from one surface to another. The shading system in card drawing is a rare invention; one method proposes to produce the effect of shadow by lines drawn thicker or thinner, closer together or wider apart; another, by crossing lines, etc., whilst in nature nothing of all this trumpery can be found.

Why should objects, whose surfaces are represented smooth in the light, be represented crossed in the shadow? The photograph will offer the best guide for technical means in that direction. Technical restrictions will only force themselves upon those who work on materials which will not admit of a free treatment, as wood, steel, stone, etc. Shading is a perverted term; nature gives us no means for identifying it. Modeling is the word for which it has been substituted. In card drawing, the term shading is used as the end of modeling, while in truth shading is but the means to this end. Light may be thrown upon an object from as many sides as possible, and in

such manner that not one of its surfaces will be in shadow, yet the object will show its relief and can be reproduced on canvas, conveying fully the same idea of relief as though it were exposed to but one source of light. The vocabulary of a card-drawing teacher is soon exhausted; "too long, too short; too broad, too narrow, too thick, too thin; too heavy, too light; and, in the wrong direction."

It is clear that a teacher can only successfully teach that which he knows himself; and if a drawing-teacher teaches from cards, it is ample proof that he has not the capacity to teach drawing from objects; for if he had, he would never stultify himself by the use of a method so irrational. The aim, from the beginning, should be to teach a child to see and to understand form in all its conditions and relations, regardless of the technical result produced at first; since in the technical acquirements in this, as in all other pursuits, practice makes perfect. The summing up of all amounts to the following: whoever is capable of producing good results in drawing or painting from nature, will find no manner of difficulty in copying a drawing or a painting, whilst the reverse is entirely out of question. A man who can produce, can surely copy his own product.

Part II.

First Lessons in Drawing. — The first lesson in drawing should be an object lesson, and in giving this lesson three points must be considered: first, to train the eye; second, to exercise the hand; third, to cultivate the understanding.

In looking at an object, the first impression the eye receives is its general boundary; next, the eye wanders within that boundary to examine the minutest features. The only technical means for describing these boundaries, and also for determining the parts within, is the *line*, and with this means the child should be directed to describe the impressions received upon a plane surface, be it upon a slate or paper. The child will make an attempt, and it will be at once perceived that the eye will neither be able to recognize the true direction of a line, nor will the slate- or lead-pencil submit to be guided in a desired direction; and that, in consequence, the attempt proves a failure. This is the most opportune occasion to act upon the child's understanding. The child is perplexed and its interest excited, therefore a great effort must be made on the part of the teacher to leave an impression on the mind which the child can realize, and one which will never be subject to a contradiction during the entire course of the study of form. Unless this point is made, it is a question whether the mind of a child will *ever* be so readily accessible to a subsequent new proposition.

The most striking and valuable disclosure that can be made to a child, is to illustrate the rule: "How to construct one

straight line, at right angles to another;" and in order to present this rule in its most valuable form, the direction of the first line given should be horizontal, in consequence of which, the line constructed at right angles must needs be vertical. After the illustration is concluded upon the board, if the teacher holds a plumb line over the vertical chalk mark, and a cup brim full of water under the horizontal line, the impression made on the mind of the child can never be effaced from its memory as long as it is possessed of reason. This, then, has restored the confidence of the child, that had been shaken in its first attempt in the new study, and if this success is properly followed up, it cannot otherwise than create a strong desire to hear the next proposition.

The teacher can now illustrate with objects of industrial production how almost every object of use is constructed upon this basis; the chair, the table, the bureau, the washstand, the glass, the bowl, the castors, and every part belonging thereto; the houses, doors and windows, etc., *ad infinitum*. Also, it will be realized that all animated nature is constructed upon the same basis; that in the human being, in an upright position, equally supported on both feet, the central line is vertical, whilst the complementary features of either half (externally) invariably lie in a horizontal direction; and so throughout the animal kingdom. How much consciousness has thus been gained by little! and to what extent will not this simple lesson lead, in directing the child's observations!

We have now advanced to a point at which it is necessary to give the child some assurance of its ability to acquire skill in a mechanical direction; that it may, with proper application and care, learn to perform certain things as well as they can be performed; and the teacher will henceforth divide his lessons into two kinds, viz: object lessons, and exercises in construction.

OBJECT LESSONS.—It is evident that in the investigation of natural objects, with a view of reproducing the impression received, on a plane surface, no mechanical instruments can be called to aid, except the plumb-line and the straight-edge (pencil). The one, to determine points within an object, falling in a vertical direction, the use of which can be easily acquired; the other, to determine points lying in a horizontal direction, by holding up a pencil. When the head is erect, the pupils of the eyes lie horizontally, and with some practice the direction desired can be gauged.

It is valuable for teachers to know, that children will never, at first, attempt to describe an object as they see it, but as they know it to be. In an effort to delineate a human head, the child may be found to reason somewhat as follows: "A head is round, it has two eyes and one mouth that lie flat, one nose and

two ears that 'stick out.'" These conclusions are forthwith illustrated; and, to its utter astonishment, after having located the eyes and the mouth within the circumference, the nose projecting from one side of the curve and an ear from the opposite side, there remains no room for the second ear. The child perceives that something is wrong, and is puzzled to find the reason; it recapitulates, but that only increases the mystery. This peculiarity can best be observed in a class of children placed before a cast of a human hand or head. It will be found in the first attempt made to reproduce such objects on paper, that, if it be a hand, the child will draw four fingers and a thumb, regardless of whether all of the fingers, or the thumb, are visible from its point of view or not; and it will not realize that if a finger is foreshortened, the impression received is different from one presenting its full length to the eye. The child will, with full confidence, draw four fingers and a thumb, and if the thumb and little finger turn out smaller than the other fingers, the author may be considered a prodigy. Again, if a face present a three-quarter view, equal justice will be done to the eye on the off side of the face, which is partly shut out from view by the projection of the nose, as to the eye which presents itself fully to view; and this because the child *knows* that the off eye is not a whit smaller than the other. It is here necessary that the teacher should describe the form of the object in question on paper, and invite the child to follow the movements of his pencil with the eye and compare the lines with the original forms.

It is of great importance that the child should be made thoroughly acquainted with the nature of the task, and nothing can be attained more easily.

The impression which the eye receives of an object is to be portrayed upon a plane surface. The object being a solid, and in consequence being capable of representation from an indefinite number of points of view, it is necessary that the conditions governing the picture which the eye received of the object, in its relative position, should be clearly demonstrated. To accomplish this end, two things are necessary: first, that during the time occupied by actual illustration, the object remain in a fixed position; second, that the child retain the position first assigned to it, during the entire proceedings. The teacher will produce a pane of glass upon which equal squares are described, and hold it touching the nearest point on the surface of the object, at right angles to the line of vision (of the pupils), beginning at one extreme side of the object All children sitting on the corresponding side of the room will now find the boundary, as well as the features, incribed into the squares, and the picture thus received into the surface of the glass reveals precisely the manner of producing its appearance, from a given

point of view, on the plane surface; and if this pane of glass is made stationary, and an equal number of squares is described upon the paper or slate to those on the glass through which the picture of the object is transmitted, the child realizes the phenomena readily by tracing the lines within the squares, even though at first the results may not prove satisfactory. This method of investigation will, owing to its simplicity, consistency and truth, so strongly impress the mind, that the substance of the illustrations will remain indelible. Thus the child has received the most important notions of the phenomena of form.

LESSONS IN CONSTRUCTION.—These lessons are not less important for the education of the eye and the development of the understanding in the study of form, than object lessons, and the same amount of time should be devoted to each. The first exercise will be to teach a child to draw and recognize straight and regularly curved lines. One of the first examples of construction involves both: how to construct a right angle. Before a child can fully recognize a right angle, it can gain but an imperfect comprehension of an acute or obtuse angle, since the former is the measure of the latter.

It will be considered but reasonable, if the task to draw straight lines and regular curves is assigned, to allow the pupils the use of the straight edge and the compasses as indispensable. What artist, technically ever so skillful, would volunteer to draw a straight line or a circle without the aid of these instruments, free-hand, in competition with a boy or girl thirteen years of age, properly trained to their use, and allowed to use them? And what can offer more satisfaction to a child, than the assurance that, with these instruments, it can draw certain lines as accurately as an artist? The possession of these instruments offers an emolument, and the child will make strong efforts to master their use, and will soon be prepared to construct all regular plane figures, from the triangle to the ellypse.

ENGAGING MANNERS.—There are a thousand engaging ways, which every person may put on, without the risk of being deemed either affected or foppish. The sweet smile, the quiet, cordial bow, the earnest movement, in addressing a friend, or more especially a stranger, who may be recommended to us, the graceful attention which is captivating when united with self-possession; these will insure us the good regards of all. There is a certain softness of manner which should be cultivated, and which, in either man or woman, adds a charm that is even more irresistible than beauty.

DEPARTMENT OF PUBLIC INSTRUCTION.

ON ENTERING upon his official duties, the State Superintendent appointed a State Board of Examination, composed of teachers, who are residents of San Francisco. The business of the Board was transacted very efficiently until the State Superintendent's office was removed to Sacramento. Then the meetings became very irregular, and vexatious delays occurred in the dispatch of business. The State Superintendent saw himself, therefore, compelled to reorganize the Board by appointing four teachers who are residents of Sacramento. Accordingly, on the 1st of October, 1873, a new Board was appointed, consisting of A. H. McDonald, J. H. Eickhoff, Miss M. J. Watson, and Miss Annie P. Weeks. The State Superintendent is *ex-officio* Chairman, and J. H. Eickhoff was elected Secretary. All applications for State certificates or diplomas must be sent to the State Superintendent's office at Sacramento.

SEVERAL County Superintendents seem to hold that if from any reason whatever an election for Trustees is illegal, they, as County Superintendents, have the power to determine the legality of the election, and to set aside such election, and to appoint Trustees in place of those elected by the people. Now, a County Superintendent is only an executive officer, and no executive officer, not even the Governor of the State, has the power to determine the legality of an election, or to set aside an election. An executive officer can only appoint to an office in cases and under circumstances spectfied by law. A County Superintendent can appoint a Trustee *only* when the people fail to elect, or when a Trustee neglects to qualify within a certain time, or when a Trustee resigns. The question of the legality of an election can only be decided by the County Court, in the manner prescribed by law.

SEVERAL County Superintendents have asked whether they have the power to remove a Board of Trustees upon a petition from the majority of the parents or voters of a district? Certainly *not*. This will be sufficient answer. To go into the details of the question, at this late date, would be an insult to the general intelligence of school officers.

THE question has been asked whether a Board of Trustees can maintain more than one school at the same time. We think the question refers to a case where a Board of Trustees maintains separate schools in different parts of the district. We see nothing wrong in this; on the contrary, we hold it is the plain duty of the Trustees to establish as many schools, and in as many places, as the needs of the district may demand.

A DISTRICT, organized some years ago, selected a site for a school-house, but erected no building thereon. Since then the boundaries of the district have been so changed that the present site is no longer centrally located. The question is asked whether the site may be changed on petition, or whether it must be changed by a vote of the district. If there is any contest in the matter, or if the new site must be purchased, the district must certainly vote upon the question; but if the new site is donated, and its location is unobjectionable to the patrons of the school, the Trustees may act upon the question in accordance with the prayer of a petition.

THE same district, having maintained no public school for several years, has received for those years no public school moneys. Last year, however, a three months' public school was maintained, and the district asks whether it is not entitled to its share of the public school moneys for the present year. Undoubtedly yes; for the default of maintaiuing a tree months' school during any year entails a forfeiture of only the next year's portion of the school funds.

COUNTY SUPERINTENDENTS,

ELECTED SEPTEMBER 3D, 1873, AND THEIR POST OFFICES.

COUNTIES.	Names.	Post Office.
Alameda	Rev. W. F. B. Lynch	East Oakland
Alpine	A. C. Pratt	Monitor
Amador	Rev. S. G. Briggs	Jackson
Butte	H. T. Batchelder	Oroville
Calaveras	J. B. Garvey	Angels
Contra Costa	A. Thurber	Pacheco
Colusa	J. E. Putnam	Colusa
Del Norte	Max Lippowitz	Crescent City
El Dorado	Jno. Munson	Placerville
Fresno	Rev. T. O. Ellis, Sr.	King's River
Humboldt	E. C. Cummings	Ferndale
Inyo	Geo. H. Hardy	Independence
Kern	L. A. Beardsley	Bakersfield.
Klamath	S. L. Finley	Sawyer's Bar
Lake	Louis Wallace	Middletown
Lassen	Z. N. Spalding	Susanville
Los Angeles	Geo. H. Peck	El Monte
Marin	Saml. Saunders	San Rafael
Mariposa	David Egenhoff	Mariposa
Mendocino	J. H. Seawell	Ukiah City
Merced	B. F. Fowler	Snelling
Mono	E. R. Miner	Benton
Monterey	R. C. McCroskey	Salinas City
Napa	Rev. G. W. Ford	Napa
Nevada	Frank Power	North San Juan
Placer	John T. Kinkade	Auburn
Plumas	W. S. Church	Quincy
Sacramento	Dr. G. R. Kelly	Sacramento
San Bernardino	Henry Goodcell, Jr.	San Bernardino
San Diego	J. H. S. Jamison	North San Diego
San Francisco	James Denman	San Francisco
San Joaquin	T. O. Crawford	Stockton
San Luis Obispo	Jas. M. Felts	Cambria
San Mateo	C. G. Warren	Redwood City
Santa Barbara	Rev. J. C. Hamer	Santa Barbara
Santa Clara	J. G. Kennedy	San José
Santa Cruz	W. H. Hobbs	Soquel
Shasta	L. K. Grim	Shasta
Sierra	A. M. Phalin	Port Wine
Siskiyou	Wm. Duenkel	Yreka
Solano	C. W. Childs	Suisun City
Sonoma	A. C. McMeans	Santa Rosa
Stanislaus	James Burney	Modesto
Sutter	M. C. Clark	Yuba City
Tehama	Chas. D. Woodman	Tehama
Trinity	Hiram H. Bragdon	Weaversville
Tulare	R. P. Merrill	Porterville
Tuolumne	John Murnan	Sonora
Ventura	F. S. S. Buckman	San Buenaventura
Yolo	G. N. Freman	Woodland
Yuba	Th. H. Steel	Marysville

STATE NORMAL SCHOOL.

I.—THE OBJECTS AND WANTS OF THE NORMAL SCHOOL.

To the Board of Trustees of the State Normal School of California:

GENTLEMEN:—Your Committee, to whom was referred the matter of "The Objects and Wants of the Normal School," beg leave respectfully to submit the following report:

The primary object of a Normal School is to fit young persons to enter upon the work of teaching intelligently, and to perform the work successfully.

Theoretically, a Normal School should teach only *how* to teach, receiving pupils after they are fully prepared in scholastic attainments, and giving them the necessary instruction in the philosophy of education and methods of teaching.

Practically, it has in all cases, your Committee believe, been found necessary to devote much of the time and labor of the school to preparing pupils in the branches to be taught.

Several causes conspire to make this divergence between the theory and the practice in Normal Schools. Among them are the following:

I. The profession of teaching has, as yet, not become so permanent and remunerative that pupils will take the time, after having acquired sufficient knowledge to obtain certificates, to qualify themselves in methods of teaching, and a school doing only professional work, would find itself without pupils.

II. The successful teacher requires more positive, exhaustive, and definite knowledge of the branches he is to teach than is usually given in other schools.

III. It is believed, and perhaps truly, that there is a certain economy in combining the instruction *how* to teach with that which gives *what* is to be taught.

IV. Most persons who desire to fit themselves for teaching, desire at the same time to acquire the knowledge that will fit them for any or all the duties of life.

Whether all this is founded in good philosophy or not, we are obliged to accept it as true, and schools must, to meet the public demand, be organized and conducted accordingly.

It remains, then, to present the plan which will, under the circumstances, best meet public demand and accomplish the desired end. In connection with this, your Committee make the following suggestions:

The school must be manned by a corps of well qualified instructors. This involves teachers who, in addition to the thorough and critical knowledge of the branches taught, which is absolutely necessary, shall have devoted time, study, and thought enough to the subject of teaching, so that they have arrived at the natural or normal method of presentation, and who are sufficiently acquainted with the laws of menta growth and development to be able to judge whether their work is accomplishing what they desire. They must also have that somewhat rare power of *selection*, which will enable them to distinguish between essentials and non-essentials and to work accordingly.

In addition to this, they must have that mental strength and activity which will enable them, when brought into contact with adult and vigorous minds, to lead them, instead of being led by them.

If such teachers can be found and secured, the success of your school is certain.

A Normal School, from its very nature, must be progressive. No school, and no

teacher in the school, must rest contented upon the laurels already gained, or the point already attained. There is need for constant intercourse with educators the world over. One who would hold and worthily fill his position as a teacher in a Normal School can do so only by a life of labor.

The course of study and training should provide for two distinct kinds of work. That is, there are certain subjects that teachers are required to *know*, and there are other subjects that, under existing circumstances, they can only be expected to know *about*. Could one course of study be extended to three or even four years, we might enlarge the first class of subjects and diminish the second. That, for the present, seems impracticable.

There must, then, be given a thorough, searching, definite knowledge of the branches which are to be taught in the public schools, and a power to express that knowledge with clearness and precision. Nothing can take the place of this. And especially should this knowledge and power be given in the structure and use of our mother tongue. Language is the teacher's instrument; if he would be successful he must become the master of it.

Of the second class of subjects—those upon which we may expect only general information—but a *general* knowledge can be given. This knowledge should be accurate, as far as it goes; should give the boundaries and divisions of the subject, and such other information as will enable the pupil to pursue it alone after leaving the school, and if possible, such a love for study as will give him an inclination so to do.

Many of these so-called higher studies have a very important economic value; that is, they are closely connected with the laws of life and health; with the daily avocations of life, and with the protection and development of the resources of our State. The instruction in these should be such as to bring this relation constantly before the pupil, thus compelling him to realize that our schools should prepare children for the practical duties of life.

As many of these studies require for their proper prosecution illustrative apparatus, the Normal School must have at as early a time as possible a complete apparatus.

Most of the points in reference to the organization of the school having been presented by the Principal and adopted by the Board at its last meeting, your Committee need not here recapitulate them.

All of which is respectfully submitted.

B. CORY,
CHAS. H. ALLEN, } *Committee.*

San José, Oct. 22d, 1873.

II.—PREPARATORY DEPARTMENT.

To the Board of Trustees of the State Normal School of California:

GENTLEMEN:—Your Committee, to whom was referred the matter of "Additional Teachers in the Normal School," "The Opening of a Preparatory Department," and "The Organization of a Past-graduating Course," respectfully report the following:

I. That we recommend the Board to authorize the Committee on Teachers to procure, as soon as they are satisfied that they can secure the proper person, an additional male teacher, at a salary of not to exceed $2,400 per year.

II. That the Principal of the school be authorized to open a Preparatory Department, and, in conjunction with the Committee on Teachers, to employ a Principal for

the same, at a salary of not to exceed $1,200 per annum. That a tuition fee be charged for instruction in this department of not less than $1 per week. That the Committee on Teachers be authorized to establish such rules and regulations for the admission to said department as they see fit, such rules and regulations to be submitted to the Board for their approval.

III. That there be opened, in connection with the last term in the year, a past graduate class, to which may be admitted graduates of this or other Normal Schools, High Schools, Colleges, or Academies, who shall present satisfactory evidence of having taught at least one year successfully. That the instruction in this class be mainly professional, and that to graduate from this class a professional diploma be granted.

All of which is respectfully submitted.

San José, Oct. 22d, 1873.

JAMES DENMAN,
HENRY N. BOLANDER,
CHAS. H. ALLEN, } *Committee.*

The report of the Committee was accepted and each of the recommendations adopted by the Board.

III.—CIRCULAR.

INSTITUTE TERM.—No provision having been made for a State Teachers' Institute, an Institute Term will be held in connection with the Normal School, beginning Tuesday, January 6th, 1874, and ending Friday, January 23d, 1874. The term is made somewhat shorter than the session last year, with the hope that more teachers may be present during the entire session. The members of the Institute will receive two hours' instruction per day from the Faculty of the Normal School and others, upon subjects pertaining to the duties of the school-room, and in addition will have the privilege of attending any of the classes in the Normal School, and of witnessing the instruction in the Model School. Evening lectures will be delivered during the session upon educational topics, by prominent educators. The list of lecturers will be announced hereafter. Board can be had at reasonable rates, and it is expected that the railroad companies may extend the same courtesy that they did last year—free return tickets to those attending the session. County Superintendents are requsted to give notice through the local papers and in other ways, of the Institute Term, that unemployed teachers may avail themselves of this means of improvement.

PAST GRADUATE COURSE.—The Trustees have also made provision for a past graduate course, open to graduates of this or other Normal Schools, High Schools, Colleges or Academies, who may present satisfactory evidence of having taught successfully for one year. This class will be provided for only during the last term of the year. The instruction will, in the main, be professional, and to those graduating from this class a professional diploma will be granted. The past graduate course will afford an opportunity to teachers to review their studies, to become acquainted with the most approved methods of instruction, and by the aid of the apparatus with which the school is soon to be supplied, perhaps to become more familiar with illustrative apparatus and more skillful in its manipulation.

PREPARATORY CLASS.—A preparatory class will hereafter be connected with the

school, where those who are not qualified to enter the school may find means of qualifying themselves, under the supervision of the Normal School. In this a tuition fee will be charged. All other classes are free. For further particulars, address

CHAS. H. ALLEN,
Principal State Normal School, San Jose, Cal.

WE CLIP the following from the Petaluma *Argus:*

Petaluma has an excellent school department. At no time for years has the community been so well satisfied with the administration of school affairs. Perfection has never yet been reached in educational matters, and there is, of course, room for improvement; but we do not believe there is a city in the State of the size of Petaluma, in which the public schools as a whole are superior to ours. The High School fills a want that has long been felt. It is ably conducted and justly popular. It deserves the support and encouragement of the entire community, of whose material as well as educational interests it is and will continue to be a large promoter. The Grammar and Primary departments are in the hands of teachers who, so far as we are able to learn, perform their duty faithfully and give good satisfaction. All the schools are well attended, the number of pupils enrolled last month being 568, which is 23 greater than in the corresponding month last year.

COUNTY Superintendents elect take office on the first Monday in March, 1874, and hold office till the first day of January, 1876.

BOOK NOTICES.

ST. NICHOLAS, FOR NOVEMBER. Published by Scribner & Co., 654 Broadway, New York. $3 00 per annum.

In *Scribner's Monthly* for July, 1873, appeared an article on *Children's Magazines*, which we should like to print in full; but we have room for only an extract or two:

"Sometimes I feel like rushing through the world with two placards—one held aloft in my right hand, BEWARE OF CHILDREN'S MAGAZINES! the other flourished in my left, CHILD'S MAGAZINE WANTED! A good magazine for the little ones was never so much needed, and much harm is done by nearly all that are published. In England, especially, the so-called juvenile publications are precisely what they ought not to be. In Germany, though better, they too often distract sensitive little souls with grotesquerie. Our magazines timidly approach the proper standard in some respects, but fall far short in others. We edit for the approval of fathers and mothers, and endeavor to make the child's monthly a milk-and-water variety of the adult's periodical. But, in fact, the child's magazine needs to be stronger, truer, bolder, more uncompromising than the other. Its cheer must be the cheer of the bird-song, not of condescending, editorial babble. If it *mean* freshness and heartiness, and life and joy, and its words are simply, directly and musically put together, it will trill its own way. We must not help it overmuch. In all except skillful handling of methods, we must be as little children if we would enter this kingdom.

"If now and then the situation have fun in it, if something tumble unexpectedly, if the child-mind is surprised into an electric recognition of comical incongruity, so that there is a reciprocal "ha, ha!" between the printed page and the little reader, well and good. But, for humanity's sake, let there be no editorial grimacing, no tedious vaulting back and forth over the grim railing that encloses halt and lame old jokes long ago turned in there to die.

"Let there be no sermonizing either, no wearisome spinning out of facts, no rattling of the dry bones of history. A child's magazine is its pleasure-ground. Grown people go to their periodicals for relaxation, it is true; but they also go for information, for suggestion, and for to-day's fashion in literature. But with children the case is different. They take up their monthly or weekly because they wish to, and if they

don't like it they throw it down again. Most children of the present civilization attend school. Their little heads are strained and taxed with the day's lessons. They do not want to be bothered nor amused, nor taught, nor petted. They just want to have their own way over their own magazine. They want to enter the one place where they may come and go as they please, where they are not obliged to mind, or say "yes ma'am," and "yes sir,"—where, in short, they can live a brand-new, free life of their own for a little while, accepting acquaintances as they choose and turning their backs without ceremony upon what does not concern them. Of course they expect to pick up odd bits and treasures, and to now and then "drop in" familiarly at an air-castle, or step over to fairy land. They feel their way, too, very much as we old folk do, toward sweet recognitions of familiar day-dreams, secret goodnesses, and all the glorified classics of the soul. We who have strayed farther from these, thrill even to meet a hint of them in poems and essays. But what delights *us* in Milton, Keats and Tennyson, children often find for themselves in stars, daisies, and such joys and troubles as little ones know. That this comparison holds, is the best we can say of our writers. If they make us reach forth our hands to clutch the star or the good-deed candle-blaze, what more can be done?

"A child's periodical must be pictorially illustrated, of course, and the pictures must have the greatest variety consistent with simplicity, beauty aad unity. They should be heartily conceived and well executed; and they must be suggestive, attractive and epigrammatic. If it be only the picture of a cat, it must be so like a cat that it will do its own purring, and not sit, a dead, stuffed thing, requiring the editor to purr for it. One of the sins of this age is editorial dribbling over inane pictures. The time to shake up a dull picture is when it is in the hands of the artist and engraver, and not when it lies, a fact accomplished, before the keen eyes of the little folk. Well enough for the editor to stand ready to answer questions that would naturally be put to the flesh-and-blood father, mother, or friend standing by. Well enough, too, for the picture to cause a whole tangle of interrogation marks in the child's mind. It need not be elaborate, nor exhaust its theme, but what it attempts to do it must do well, and the editor must not over-help nor hinder. He must give just what the child demands, and to do this successfully is a matter of instinct, without which no man should presume to be a child's editor.

"Doubtless a great deal of instruction and good moral teaching may be inculcated in the pages of a magazine; but it must be by hints dropped incidentally here and there; by a few brisk, hearty statements of the difference between right and wrong; a sharp, clean thrust at falsehood, a sunny recognition of truth, a gracious application of politeness, an unwilling glimpse of the odious doings of the uncharitable and base. In a word, pleasant, breezy things may linger and turn themselves this way and that. Harsh, cruel facts—if they must come, and sometimes it is important that they should —must march forward boldly, say what they have to say, and go. The ideal child's magazine, we must remember, is a pleasure-ground where butterflies flit gayly hither and thither; where flowers quietly spread their bloom; where wind and sunshine play freaks of light and shadow; but where toads hop quickly out of sight and snakes dare not show themselves at all. Wells and fountains there may be in the grounds, but water must be drawn from the one in right trim, bright little buckets; and there must be no artificial coloring of the other, nor great show-cards about it, saying, "Behold! a fountain." Let its own flow and sparkle proclaim it."

This article was written by Mrs. Mary Mapes Dodge, who now appears before us as the editress of *St. Nicholas;* and its first number realizes in a high degree the author's ideal, as sketched above. Among the thirty-three articles there are some for every eye, from the very little ones to the oldest of young, or old people. A whole page of large type is devoted to "little children with big eyes." Bright little jingles and "Jack-in-the-Pulpit," full of wit and wisdom, do some curious sermonizing:

"How did they learn that their ways were small?
Jean and Kitty—
How did they know they were scorned by all?
Jean and Kitty—
Why, they listened one day, at a neighbor's blinds,
And heard the family speak their minds—
What a pity!

Then there are interesting descriptions of zebras, passenger-pigeons, the curious inhabitants of the Farallone Islands, and the Piute Indians; a charmingly-told account of a fairy's visit to a bee-hive; a funny story of "Andy and the Worm;" a book about dolls, written by a boy, and written as only a boy can write. In short, the reading matter is emphatically varied and bright. The illustrations are the work of well known artists, and are of that superior character which have placed *Scribner's Monthly* in the front rank of American periodical literature.

[The Department of Public Instruction, Educational Items, and many notices of books and periodicals have been unavoidably crowded out of this number.]

NEW BOOKS.

Kindergarten Culture in the Family and Kindergarten.—(*Just Published.*) By W. N. HAILMAN, A. M. A complete sketch of Froebel's system of Early Education, adapted to American Institutions. For the use of Mothers and Teachers. 12mo. 120 pp., cloth. Illustrated. Price 75 cents.

Ray's Surveying and Navigation:—(*Just Published.*)

With a Preliminary Treatise on Trigonometry and Mensuration. By A. SCHUYLER, A. M., Professor of Applied Mathematics and Logic in Baldwin University; Author of "Higher Arithmetic," "Principles of Logic," and "Complete Algebra." 8vo., sheep, 403 pp. Price, $2.25: for introduction, $1.50; sample copy by mail, $1.75.

The School Stage:

By W. H. VENABLE. 27 New Juvenile Acting Plays for Exhibitions at School and Home. Plain and full directions relating to costume, properties and stage "business." Numerous illustrations by FARNY. 12mo., cloth. Price $1.25.

Eclectic Classical Series; By G. K. BARTHOLOMEW:

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II. Latin Gradual,

To accompany the author's Latin Grammar. 12mo., 150 pp., hf. roan. Price $1.25. Sample copies and supplies for introduction, 84 cents.

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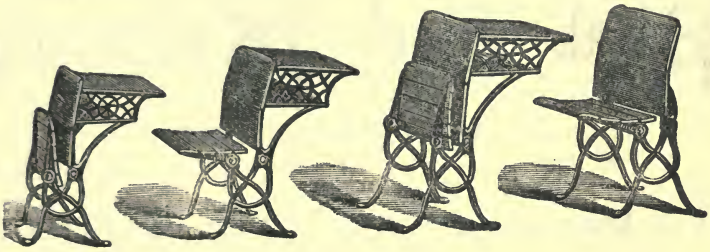

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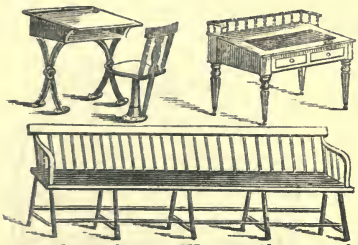

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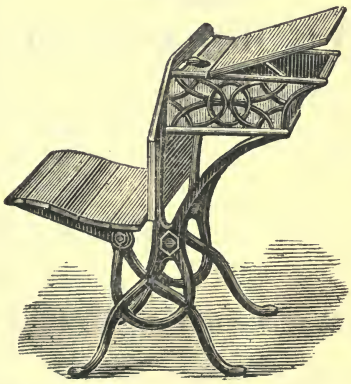

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REGULATIONS OF THE NORMAL SCHOOL.

1. All pupils, on entering the School, are to sign the following declaration:

"We, the subscribers, hereby declare that our purpose in entering the State Normal School is to fit ourselves for the profession of Teaching, and that it is our intention to engage in teaching in the Public Schools of this State."

2. To enter the Junior Class male candidates must be seventeen years of age; and female candidates sixteen. To enter the Senior Class they must be one year older.

3. All applicants are required to present letters of recommendation from the County Superintendent of the county in which they reside. The holders of first or second grade teacher's certificates will be admitted on their certificates.

4. No pupil will be entitled to a Diploma of Graduation who has not been a member of the school at least one year.

GENERAL INFORMATION.

As the accommodations are ample, no limit is fixed to the number of representatives to which a county is entitled.

Pupils will be required to furnish their Text Books. Reference Books will be furnished by the school.

There is no boarding house connected with the Normal School. Good boarding can be obtained in private families at reasonable rates.

CALENDAR FOR 1873–74.

1873. Wednesday, June 18th.....First term begins.
1873. Friday, October 24th.....First term ends.

(Fall vacation, one week.)

1873. Wednesday, November 5th.....Second term begins.
1874. Thursday, March 26th.....Second term ends.

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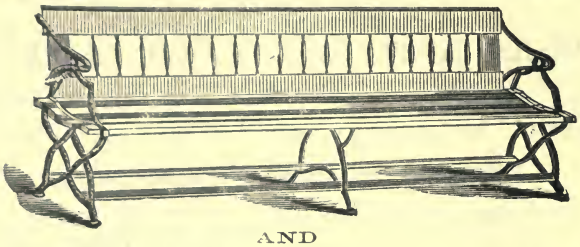

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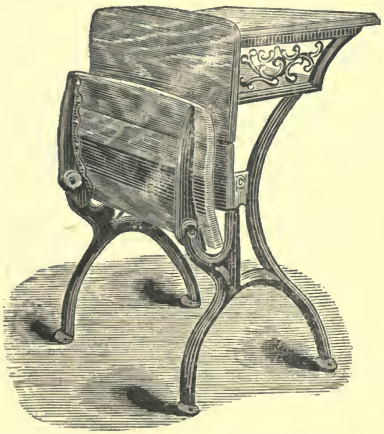

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The University of California will enter upon the beginning of its fifth year in September, 1873. At that time it is expected that the two large buildings provided by the State—the Hall of Science and the Hall of Letters—will be ready to be occupied. With the traditional college the modern schools of theoretical and applied science are also maintained, in accordance with the legislative enactments of the State of California, and with the conditions of the Congressional endowment. The Congressional gift provides for "at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to Agriculture and the Mechanic Arts."

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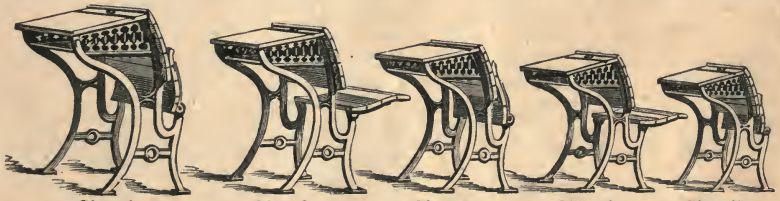

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